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1. A computer graphics system for processing image data including Z data for use in displaying three dimensional images on a display unit, comprising:
 - a depth buffer providing for temporary storage of Z data; and
 - a graphics processing unit having a graphics engine for generating image data including Z data, and a memory interface unit communicatively coupled to the graphics engine and communicatively coupled to the depth buffer via a depth buffer interface, the graphics processing unit being operative to compress at least a portion of the generated Z data, to write the compressed portion of Z data to the depth buffer via the depth buffer interface in a compressed format, to read portions of compressed Z data from the depth buffer via the depth buffer interface, and to decompress the compressed Z data read from the buffer;

wherein the graphics engine comprises:

 - a plurality of graphics pipeline stages for generating image data including Z data; and
 - a Z raster operations unit communicatively coupled with the memory interface unit, the Z raster operations unit for receiving the generated Z data, and being operative to compress selected portions of the generated Z data, to receive compressed Z data from the depth buffer via the memory unit interface and the depth buffer interface, and to decompress the compressed Z data;

whereby effective Z data bandwidth through the depth buffer interface is maximized in order to facilitate fast depth buffer access operations.

11. A computer graphics system as recited in claim 1 wherein the Z raster operations unit is operative to perform read modify write operations including the steps of:

reading previous Z data from the depth buffer via the memory unit interface and the depth buffer interface;

merging the previous read Z data with associated portions of the generated Z data to provide merged Z data; and

writing the merged Z data to the depth buffer via the memory unit interface and the depth buffer interface.

12. A computer graphics system as recited in claim 1 wherein the Z raster operations unit is operative to perform read modify write operations including the steps of:

reading previous compressed Z data from the depth buffer via the memory unit interface and the depth buffer interface;

decompressing the read Z data;

merging the decompressed Z data with associated portions of the generated Z data to provide merged Z data; and

writing the merged Z data to the depth buffer via the memory unit interface and the depth buffer interface.

25. A graphics processing unit for processing image data including Z data for use in displaying three dimensional images, the graphics processing unit being adapted for

coupling with a depth buffer via a depth buffer interface, the depth buffer providing for temporary storage of Z data, the graphics processing unit being operative to compress at

least a portion of the Z data, to write the compressed portion of Z data to the depth buffer via the depth buffer interface in a compressed format, to read portions of compressed Z data from the depth buffer via the depth buffer interface, and to decompress the compressed Z data read from the depth buffer, the graphics processing unit comprising:

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a graphics engine for generating image data including Z data; and
a memory interface unit communicatively coupled to the graphics engine and being adapted for communicative coupling with a depth buffer via a depth buffer interface;

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wherein the graphics processing unit is operative to perform read modify write operations including the steps of:

reading previous Z data from the depth buffer via the memory unit interface and the depth buffer interface;

merging the previous read Z data with associated portions of the generated Z data to provide merged Z data; and

writing the merged Z data to the depth buffer via the memory unit interface and the depth buffer interface.

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27. A graphics processing unit as recited in claim 25 being further operative to compress selected ones of a plurality of tiles of the generated Z data based on a quantitative analysis of the Z data, each of the tiles of Z data having a plurality of pixels arranged in an array, each of the pixels being disposed at an associated (X,Y) coordinate of the array, and having an associated Z value.

30. A graphics processing unit as recited in claim 25 wherein the graphics engine comprises:

a plurality of graphics pipeline stages for generating image data including Z data;
and

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a Z raster operations unit communicatively coupled with the memory interface unit, the Z raster operations unit for receiving the generated Z data, and being operative to compress selected portions of the generated Z data, to receive compressed Z data from the depth buffer via the memory unit interface and the depth buffer interface, and to decompress the compressed Z data.

32. A graphics processing unit as recited in claim 25 wherein the graphics processing unit is operative to perform read modify write operations including the steps of:

reading previous compressed Z data from the depth buffer via the memory unit interface and the depth buffer interface;

decompressing the read Z data;
merging the decompressed read Z data with associated portions of the generated Z data to provide merged Z data; and

writing the merged Z data to the depth buffer via the memory unit interface and the depth buffer interface.

33. A graphics processing unit as recited in claim 25 wherein the read modify write operations further include the steps of:

compressing the merged Z data; and
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writing the merged Z data to the depth buffer via the memory unit interface and the depth buffer interface in a compressed format.

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37. A graphics processing unit as recited in claim 25 wherein the graphics processing unit further comprises:

a write operation accumulation unit for receiving the merged Z data, and being operative to accumulate portions of merged Z data that are associated with a current tile of merged Z data; and

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a compression engine for receiving the accumulated merged Z data, and being operative to compress the accumulated merged Z data to provide compressed Z write data to the memory interface unit to be written to the Z buffer in a compressed format.

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39. A graphics processing unit as recited in claim 25 wherein the memory interface unit further comprises a tag memory storage unit for storing the compression status information, the tag memory storage unit being responsive to a particular one of the memory address values, and operative to provide the compression status information associated with the particular memory address value.

Please add the following new claims:

54. A method for storing depth data, the method comprising:

identifying a plurality of pixels, each of the plurality of pixels associated with a corresponding depth value;

determining whether the depth values associated with the plurality of pixels are compressible;

responsive to the depth values associated with the plurality of pixels being compressible, compressing the depth values and storing at least an indication of the compressed depth values in a compressed format; and

responsive to the depth values associated with the plurality of pixels being non-compressible, storing at least an indication of the depth values in a non-compressed form.

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55. The method of claim 54, wherein determining whether the depth values are compressible comprises:

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determining a gradient corresponding to a depth value associated with a first pixel and a depth value associated with a second pixel;

wherein the first pixel and the second pixel are included in the identified plurality of pixels.

56. The method of claim 55, wherein determining whether the depth values are compressible further comprises:

determining whether the gradient is greater than a threshold value;

whereby the depth values associated with the plurality of pixels are determined to be non-compressible when the gradient is greater than the threshold value.

57. The method of claim 55, wherein determining a gradient comprises:

determining a difference between the depth value for the first pixel and the depth value for the second pixel.

58. The method of claim 57, wherein determining a difference comprises:
determining a horizontal difference.

59. The method of claim 57, wherein determining a difference comprises:
determining a vertical difference.

60. The method of claim 54, wherein determining whether the depth values associated with the plurality of pixels are compressible comprises:
determining a difference between the depth value for the first pixel and the depth value for the second pixel.

REMARKS

Claims 10, 26, 31 and 42-53 are canceled herein and new claims 54-60 are added.
Applicants submit that the pending claims are in condition for allowance and solicit such an indication.